# Nesting Behavior of *Encopognathus rufiventris* Timberlake

(Hymenoptera: Sphecidae)

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Encopognathus is a relatively primitive or unspecialized genus of the tribe Crabronini. According to Bohart and Menke (1976), there are 23 described species occurring in widespread temperate and tropical regions of the world except Australia. The only biological reference of which we are aware is a brief note by Arnold (1932) that E. chirindensis (Arnold) provisioned with ants of several species in Rhodesia. In light of our findings this may have been in error.

#### ENCOPOGNATHUS RUFIVENTRIS TIMBERLAKE

Nesting site.—A small colony was observed in Arroyo Seco Camp in the hilly Upper Sonoran Life Zone of Monterey County, California at an elevation of 246 meters. From May 28–June 13, 1975 about 35 nests were located in a two square meter area of hard-packed sandy soil alongside wheel tracks of a seldom used dirt road. Perhaps 20 females were active at a time, some constructing burrows and others provisioning. Entrances were scattered but some were only a few cm apart. Daily activity at the nest site extended from 10:15 AM to 5:00 PM, Pacific Standard Time. Females were engaged mostly in nest construction during the morning and provisioning during the afternoon. No males were seen at the nest site but a few were collected on small yellow composites several hundred feet away. Females exhibited an erratic hovering flight for two to three seconds just before entering or just after leaving nests.

Nest structure.—Ten nests were excavated and dissected, some at the site and others after removal to the laboratory. The entrances were about 3.5 mm in diameter, open at all times, and without a chimney although sometimes under leaves. There was no accumulation of dirt around the entrance since the female carried away excavated material in her mandibles and front legs. In this process she flew backwards from the nest opening for about 25 cm before dropping the load. Typical burrows are diagrammed in figs. 3 and 4. Each main tunnel was relatively simple, somewhat undulate, and slanting into the ground for 9.5 to 12 cm. The tunnel ended in a whorl of three to five branches with cells arranged in linear fashion (figs. 3, 4). Loose sandy soil was

THE PAN-PACIFIC ENTOMOLOGIST 52: 331-334. OCTOBER 1976



FIGS. 1-4. Encopognathus rufiventris Timberlake. FIG. 1, mature larva, lateral view. FIG. 2, facial view of mature larva with enlargements of labium and mandible. FIGS. 3-4, profiles of typical nests.

placed between the cells by the wasp as she worked back toward the entrance. Each oval cell was about 3.5 mm wide and 6.5 mm long. The greatest number of cells observed in a single nest was 16.

*Provisioning.*—Prey were small Miridae, all but a few of them adults. Four species were utilized and these were apparently obtained from nearby plants of *Verbena lasiostachys* and *Lotus scoparius*. Most frequent prey were *Macrotylus lineolatus* Uhler. Other mirids used were *Psallus seriatus* (Reuter) and several species of *Plagiognathus* (determinations by Jon Herring, U.S. Department of Agriculture, Division of Insect Identification, etc.). The female held the paralyzed prey in the middle legs as she returned to the nest. Near the opening the wasp displayed a short hovering and somewhat sidewise motion before plunging into the open nest. The time absent from the nest by 10 actively provisioning females was 50 seconds to six minutes (average 136 seconds). The prey were packed tightly, head forward or the reverse, and 12 to 18 per cell.

*Immature stages.*—No eggs were found. Larvae pushed the uneaten bug remains to one end of the cell. At maturity a silk lined cocoon was formed which was completely covered with brownish sand grains as illustrated for *Entomognathus* by Miller and Kurczewski (1972:fig. 4). The cocoons were about 3.5 mm wide and 6.0 mm long. Morphological details of a mature larva are shown in figs. 1 and 2. Figure 1 was drawn from a specimen preserved in alcohol. Figure 2 was drawn from a head briefly treated in hot KOH and mounted in balsam on a slide.

*Parasites.*—Three females of an undescribed species of *Spintharosoma* (Chrysididae) were collected after they were observed repeatedly entering the burrows of *Encopognathus rufiventris* at the nest site.

### DISCUSSION

Four presumably "primitive" genera of Crabronini have the following prey relationships: nymphal and adult mirid bugs used by *Encopognathus*, *Lygus* and other adult mirids by *Anacrabro*, leafhoppers by *Entomocrabro*, and chrysomelid beetles by *Entomognathus*. The use of different orders of insects by related genera may seem unusual. However, *Belomicrus*, which has many points of morphological resemblance with *Encopognathus* but is in a separate tribe Oxybelini, is known to provision with beetles in one section of the genus and nymphal and adult mirids in another section (Bohart and Menke, 1976). Among published reports on biology and larval morphology, the greatest similarities with *Encopognathus rufiventris* have been found in the study of *Entomognathus memorialis* Banks by Miller and Kurczewski (1972). Burrow formation, larval structure, and cocoon appearance are all much the same as those described and figured by the above authors.

Many small sphecids do not make a formal closure of the nest on completion and *E. rufiventris* belongs to this sort. The entrance is probably filled in a short time by blowing dust or as a result of light rains. E. rufiventris females have a very short foreleg pecten as would be expected in a wasp which omits nest closure.

#### LITERATURE CITED

- ARNOLD, G. 1932. New species of the Ethiopian Sphegidae. Occas. Pap. Rhodesian Mus. (1)1: 38.
- BOHART, R. M. AND MENKE, A. S. 1976. Sphecid wasps: A world generic revision. University of California Press Berkeley. 695 pp.
- MILLER, R. C. AND KURCZEWSKI, F. E. 1972. A review of nesting behavior in the genus *Entomognathus*, with notes on *E. memorialis* Banks. Psyche 79: 61-78.

## RECENT LITERATURE

LES CARABIDAE DU QUEBEC ET DU LABRADOR. A. Larochelle, Department de Biologie de College Gourget, Rigand. Bull. I. 255 pp. 1975. Available from author, \$15.00 (Canadian).

This publication is difficult to categorize. The content is nearly evenly split between an annotated catalogue of the species of Carabidae and Cicindelidae known to occur in Quebec, and an atlas of distribution maps. Minor segments are devoted to providing instructions for use of the catalogue and atlas, lists of collections consulted, lists of species doubtfully recorded or to be expected in Quebec, and a bibliography. Printing is by the offset process, with unjustified right margins. A notice near the beginning of the work states that only 400 copies have been printed, possibly explaining the relatively expensive price. Primarily of interest to specialists of Carabidae or of the fauna of eastern Canada.—Editor.

- THE STONEFLIES, OR PLECOPTERA, OF ILLINOIS. T. H. Frison. Bulletin of the Illinois Natural History Survey, 20:281-471. (Reprinted by Entomological Reprint Specialists, P.O. Box 77224, Dockweiler Station, Los Angeles, California 90007). \$15.00.
- THE MAYFLIES OR EPHEMEROPTERA, OF ILLINOIS. B. D. Burks. Bulletin of the Illinois Natural History Survey, 26:1–216. (Reprinted by Entomological Reprint Specialists, P.O. Box 77224, Dockweiler Station, Los Angeles, California 90007). \$15.00.

These works remain useful summaries of the systematics, distribution and biology of the taxonomic groups which are included. Despite the geographic restriction suggested by the titles, the effective area of coverage is much larger, in terms of the proportion of North American species included. Both volumes are generously illustrated, and include lucid discussions of life history and ecology of these important aquatic insects.—Editor.